EPA/ROD/R08-98/076
1998

EPA Superfund
Record of Decision:

CALIFORNIA GULCH
EPA ID: COD980717938
OU 03
LEADVILLE, CO
05/06/1998

EPA 541-R98-076

<IMG SRC 980760>

RECORD OF DECISION

STOCKPILED FINE SLAG
ARKANSAS VALLEY SMELTER SLAG PILE
CALIFORNIA GULCH SUPERFUND SITE (OPERABLE UNIT 3)
LEADVILLE, COLORADO

May 1998

U.S. Environmental Protection Agency
999 18th Street, Suite 500
Denver, Colorado 80202

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The U.S. Environmental Protection Agency (EPA), with the concurrence of the Colorado Department of Public Health and Environment (CDPHE), presents this Record of Decision (ROD) for stockpiled fine slag at the Arkansas Valley smelter slag pile of Operable Unit 3(OU 3) within the California Gulch Superfund Site in Leadville, Colorado. The ROD is based on the Administrative Record for California Gulch OU3, including the Remedial Investigation/Feasibility Study (RI/FS), the Proposed Plan, and the public comments received. The ROD presents a brief summary of the RI/FS, actual and potential risks to human health and the environment, and the Selected Remedy. EPA followed the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, the National Contingency Plan (NCP), and appropriate guidance in preparation of the ROD. The three purposes of the ROD are to:

1. Certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act (collectively, CERCLA), and, to the extent practicable, the NCP;

2. Outline the engineering components and remediation requirements of the Selected Remedy; and

3. Provide the public with a consolidated source of information about the history, characteristics, and risk posed by the conditions of the stockpiled fine slag at the Arkansas Valley Smelter slag pile of OU 3, as well as a summary of the cleanup alternatives considered, their evaluation, the rationale behind the Selected Remedy, and the agencies' consideration of, and responses to, the comments received.

The ROD is typically organized into the following three distinct sections:

1. The Declaration section functions as an abstract for the key information contained in the ROD and is the section of the ROD signed by the EPA Acting Regional Administrator and the CDPHE Director;

2. The Decision Summary section provides an overview of the OU 3 characteristics, the alternatives evaluated, and the analysis of those options. The Decision Summary also identifies the Selected Remedy and explains how the remedy fulfills statutory requirements; and

3. The Responsiveness Summary section addresses public comments received on the Proposed Plan, and other information in the Administrative Record. However, since the EPA did not receive any written public comments, this ROD will not contain a Responsiveness Summary.

DECLARATION

SITE NAME AND LOCATION

Stockpiled Fine Slag
Arkansas Valley Smelter Slag Pile
California Gulch Superfund Site (Operable Unit 3)
Leadville, Colorado

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for stockpiled fine slag at the Arkansas Valley smelter slag pile of Operable Unit 3 within the California Gulch Superfund Site in Leadville, Colorado. EPA, with the concurrence of CDPHE, selected the remedy in accordance with CERCLA and the NCP. Note that this decision addresses stockpiled fine slag only. Other activities required for OU3, including other slag piles, the railroad easement, and the railroad yard, are addressed under a Consent Decree with the Denver & Rio Grande Western Railroad.

This decision is based on the Administrative Record for the stockpiled fine slag at the Arkansas Valley smelter slag pile of OU 3 within the California Gulch Superfund Site. The Administrative Record (on microfilm) and copies of key documents are available for review at the Lake County Public Library, located at 1115 Harrison Avenue in Leadville, Colorado, and at the Colorado Mountain College Library, in Leadville, Colorado. The complete Administrative Record may also be reviewed at the EPA Superfund Records Center, located at 999 18th Street, 5th Floor, North Terrace in Denver, Colorado.

ASSESSMENT OF THE SITE

The stockpiled fine slag at the Arkansas Valley smelter slag pile does not present an imminent or substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy is the No Action Alternative, which was presented in the Final Stockpiled Fine Slag Feasibility Study Report (FS) (Terranext, 1996a). The FS used a comparative analysis to evaluate several alternatives and identify the advantages and disadvantages of each. Selection of the No Action Alternative was based on this analysis. For the stockpiled fine slag, the Selected Remedy leaves the slag piles in their existing condition with no remediation, engineering controls, long term maintenance, or clean up planned. The Selected Remedy is protective of human health and the environment, and is considered effective because 1) no complete human or ecological exposure pathways were identified for the stockpiled fine slag and 2) the potential for release of metals in leachate from the stockpiled fine slag is minimal.

The Selected Remedy provides a contingency for resource utilization, which may be undertaken in the future if regional market demand exists for the material. Resource utilization involves the use or reuse of the slag material as a commercial product. Due to concerns about the potential for release of airborne particulates if resource utilization is undertaken, the EPA has determined that resource utilization of the stockpiled fine slag is only appropriate if it is encapsulated for reuse. Encapsulation can include the use of fine slag in concrete or asphalt aggregate; or as road base, backfill or other construction material as long as the fine slag is chemically bound or physically separated from any exposure scenario by a barrier consisting of another material. Dust suppressants to control particulate emissions and best management practices to control stormwater runoff would also be employed to contain contaminant releases from the fine slag stockpile and during implementation of the contingency remedy. Resource utilization must also take into consideration any toxic leaching potential for the fine slag.

DECLARATION STATEMENT

No remedial action is necessary to ensure protection of human health and the environment.

<IMG SRC 98076A>

DECISION SUMMARY

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LIST OF ACRONYMS AND ABBREVIATIONS

AMSL	Above Mean Sea Level
AOC	Administrative Order of Consent
ARAR	Applicable or Relevant and Appropriate Requirements
AV	Arkansas Valley
BMP	Best Management Practices
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
D&RGW	Denver and Rio Grande Western Railroad
EPA	U.S. Environmental Protection Agency
FS	Final Stockpiled Fine Slag Feasibility Study
mg/kg	milligram per kilogram
mph	miles per hour
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	Operable Unit
ppm	parts per million
PRPs	Potentially Responsible Parties
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SFS	Screening Feasibility Study
SPLP	Synthetic Precipitation Leaching Procedure

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Stockpiled Fine Slag
Arkansas Valley Smelter Slag Pile
California Gulch Superfund Site (Operable Unit 3)
Leadville, Colorado

The California Gulch Superfund Site is located in Lake County, Colorado, in the upper Arkansas River basin, approximately 100 miles southwest of Denver (see Figure 1). The Site encompasses approximately 16.5 square miles and includes the towns of Leadville and Stringtown, a portion of the Leadville Historic Mining District, and the portion of the Arkansas River from its confluence with California Gulch downstream to the Lake Fork Creek confluence. The California Gulch Superfund Site has been organized into 12 operable units (OUs). Figure 2 shows the Site boundaries and the location of OU 3.

Operable Unit 3 (Figure 2) includes three slag piles (Arkansas Valley, La Plata, and Harrison St.) owned by Denver and Rio Grande Western Railroad (D&RGW), a railyard right-of-way through Leadville and a railyard in the area of Leadville known as Poverty Flats. This Record of Decision (ROD) addresses only the fine slag 1 stockpiled as a subpile of the Arkansas Valley (AV) Smelter Slag Pile. In addition, D&RGW has identified a small volume of fine slag in the railyard (Poverty Flats). D&RGW has prepared a plan which addresses removal of the fine slag from this area to the AV Smelter Slag Pile (EPA, 1996).

The AV Smelter Slag Pile is the largest and westernmost of the three slag piles owned by D&RGW in the Leadville area (Figure 2). This pile was generated from slag produced primarily by the AV smelter facility, which operated from 1882 to 1960. The pile covers approximately 40 acres and is approximately 9,800 feet above mean sea level (AMSL). Based upon aerial photography, the pile volume in the late 1950s was approximately 1.2 million cubic yards. Today, approximately 422,000 cubic yards of slag remain on the AV Smelter Slag Pile. The volume of stockpiled fine slag at the AV Smelter Slag Pile is approximately 190,000 cubic yards. The slag pile was purchased by D&RGW from ASARCO in 1961 for use as ballast (Terranext, 1996a).

The AV Smelter Slag Pile is bounded by Leadville Sewage Treatment Plant property and State Highway 24 to the south, old smelter works to the north, wooded property to the west, and other smelter-related wastes and Stringtown to the east. California Gulch runs adjacent to the slag pile vicinity for approximately 1/5 its length. D&RGW has performed work near the California Gulch to minimize the direct contact of surface water with the slag piles. In the vicinity of the AV Smelter Slag Pile, clean fill has been bermed along the toe of the slag to prevent direct surface water from contacting the slag (Terranext, 1996a).

1 Fine slag is sorted slag which is less than 3/8 inch. Sorted slag is slag that has been physically separated into size fractions for the purpose of railroad ballast production (Terranext, 1996a).

Lake County is relatively small (380 square miles) and is predominately rural, with a 1990 population of 6,007 (U.S. Department of Commerce, 1990). About half of this population resides within the City of Leadville. The population of Lake County has fluctuated with the mining industry. The population increased to about 9,000 between 1960 and 1981 and then declined throughout the 1980's. Land surrounding OU3 is predominately dedicated to mining, commercial, and residential uses.

The climate of Lake County is dry but otherwise typical of most alpine regions in the southern Rocky Mountains. The average annual maximum temperature in the Leadville area is 50.5 degrees Fahrenheit and the average annual minimum temperature is 21.9 degrees Fahrenheit, with an annual mean temperature of 37.3 degrees Fahrenheit. The south-central portion of the county, at an elevation near 9,000 feet AMSL, receives about 10 inches of precipitation annually. Wind is predominantly from the northwest, with speeds typically from 0 to 30 miles per hour (mph) (WCC, 1993). Populated areas of Leadville are predominantly upwind of the AV Smelter Slag Pile.

2.0 OPERABLE UNIT HISTORY AND ENFORCEMENT ACTIVITIES

The California Gulch Superfund Site is located in the highly mineralized Colorado Mineral Belt of the Rocky Mountains. Mining, mineral processing, and smelting activities have produced gold, silver, lead, and zinc for more than 130 years in the Leadville area. Mining and its related industries continue to be a source of income for both Leadville and Lake County. The Leadville Historic Mining District includes an extensive network of underground mine workings in a mineralized area of approximately 8 square miles located around Breece Hill. Mining in the District began in 1860, when placer gold was discovered in California Gulch. As the placer deposits were exhausted, underground workings became the principle method for removing gold, silver, lead, and zinc ore. As these mines were developed, waste rock was excavated along with the ore and placed near the mine entrances. Ore was crushed and separated into metallic concentrates at mills, with mill tailing generally slurried into tailing impoundments.

Approximately 17 smelter facilities are reported to have once operated within the Site. Most operations ceased by about 1900, although some facilities continued to operate into the 1960's. At present, nearly all of the mines within the Site boundaries are inactive; only a few small-to-moderate-sized mining operations exist. All of the mills and smelters which operated onsite are inactive and/or demolished.

Due to historic mining, milling, and smelting operations, the Site contains many tailings impoundments, fluvial deposits, slag piles, waste rock piles, and mine water drainage tunnels. Slag on the Site is the mineralized waste byproduct of smelting, and results from the processing of lead ore in high temperature furnaces. Three major slag piles and several smaller piles remain at the Site (Figure 2). In 1961, D&RGW purchased the AV Smelter Slag Pile from ASARCO for use as railroad ballast. D&RGW purchased the La Plata slag pile from the Leadville Sanitation District in 1970. Additionally, D&RGW purchased the Harrison Street Slag Pile from NL Industries in 1983 (EPA, 1996).

The California Gulch Site was placed on the National Priorities List (NPL) in 1983), under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act(CERCLA) of 1980. The Site was placed on the NPL because of concerns about the impact of mine drainage on surface waters in the California Gulch and the impact of heavy metals loading into the Arkansas River (EPA, 1996). Several subsequent investigations were conducted within the California Gulch Superfund Site that have addressed the slag at the three D&RGW-owned piles.

In 1986, the EPA's contractor, CH2M Hill, sampled surface water, groundwater, and numerous mine waste piles, and three D&RGW slag piles as part of the California Gulch Site Remedial Investigation (RI)(EPA, 1989). The objective of the mine waste and slag sampling was to better characterize the materials in the California Gulch Superfund Site. This was the first time that the EPA had sampled slag at the Site.

In 1988, James P. Walsh and Associates, Inc. conducted a Soils Investigation. The stated objectives of this study were to define potential action levels for soil, determine background metals content of soils, delineate the extent of soil contamination, and determine sources of soil contamination. This study was initiated by ASARCO, another potentially responsible party (PRP) at the Site. Three samples of slag were collected as part of this study: one from the Harrison Street pile, one from the La Plata pile, and one from an area west of Leadville. This study did not include the AV Smelter Slag Pile (MK, 1992).

In May 1989, Jacobs Engineering performed a second sampling of slag for the EPA. The purpose of the study was to determine the concentrations of metals in the three D&RGW slag piles and to evaluate the potential for migration of these metals to soil, water or air. Potential hazards to the environment and public health from the slag in Leadville were evaluated.

On December 3, 1991, EPA and D&RGW entered into an Administrative Order on Consent (AOC), CERCLA - VIII - 92006, for the performance of a remedial investigation/feasibility study (RI/FS) of the lead slag piles. Prior to the AOC, EPA had studied the slag piles as part of other investigations at the Site. In 1992, D&RGW performed an RI (MK, 1992) that addressed seven lead slag piles, including the Arkansas Valley, Harrison, and La Plata slag piles, and one zinc slag pile. Following the RI, a Site-Wide Screening Feasibility Study (SFS) was undertaken as a joint effort between the PRPs and EPA. The SFS was completed in March 1993. It screened several remediation alternatives for all types of slag located at the AV Smelter Slag Pile based on specific criteria, such as relative cost, implementability, and effectiveness. The three alternatives retained for further evaluation were: no action, institutional controls, and resource utilization (EPA, 1996).

On December 15, 1993, D&RGW entered into a Consent Decree with EPA to perform the remainder of their site work. The Consent Decree stated EPA's concerns regarding the fine fraction of the stockpiled slag and the potential for particulate release during ballast operations as a potential human health exposure pathway. The Consent Decree required D&RGW to perform a feasibility study for stockpiled fine slag and to submit an operations plan before initiating any ballast operations. In July of 1995, D&RGW submitted a ballast operations plan to EPA. Following EPA's approval of the plan, ballast operations commenced in August 1995 (EPA, 1996).

In May of 1996, D&RGW submitted a feasibility study for the stockpiled fine slag (the FS) at the AV Smelter Slag Pile, according to the terms of the Consent Decree. The existing fine slag subpile and fine slag potentially generated from future ballast production were the focus of the FS. The FS provided a detailed analysis of the three retained remediation alternatives from the SFS as applied to the stockpiled fine slag. The result of the Feasibility Study for the stockpiled fine slag was a Proposed No Action Plan for the stockpiled fine slag as a subpile of the AV Smelter Slag Pile (EPA, 1996).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public participation is required by CERCLA Sections 113 and 117. These sections require that before adoption of any plan for remedial action to be undertaken by EPA, the State, or an individual (PRP), the lead agency shall:

1. Publish a notice and brief analysis of the Proposed Plan and make such plan available to the public; and

2. Provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the Site regarding the Proposed Plan and any proposed findings relating the cleanup standards. The lead agency shall keep a transcript of the meeting and make such transcript available to the public. The notice and analysis published under item #1 above shall include sufficient information to provide a reasonable explanation of the Proposed Plan and alternative proposals considered.

Additionally, notice of the final remedial action plan set forth in the ROD must be published, and the plan must be made available to the public before commencing any remedial action. Such a final plan must be accompanied by a discussion of any significant changes to the preferred remedy presented in the Proposed Plan along with the reasons for the changes. A response (Responsiveness Summary) to each of the significant comments, criticisms, and new data submitted in written or oral presentations during the public comment period must be included with the ROD.

EPA has conducted the required community participation activities through presentation of the RI/FS and Proposed Plan, a 30-day public comment period, a formal public hearing, and presentation of the Selected Remedy in this ROD. However, since the EPA did not receive any written public comments on the Proposed No Action Plan for the Stockpiled Fine Slag, this ROD does not contain a Responsiveness Summary.

The Proposed No Action Plan for Stockpiled Fine Slag at the AV Smelter Slag Pile was released for public comment on September 27, 1996. The RI/FS and the Proposed No Action Plan were made available to the public in the Administrative Record located at the EPA Superfund Records Center in Denver and the Lake County Public Library in Leadville. A formal public comment period was designated from September 27, through October 28, 1996.

On October 3, 1996, the EPA hosted a public meeting to present the Proposed Plan for Stockpiled Fine Slag at OU 3 of the California Gulch Superfund Site. The meeting was held at 7:00 pm in the Mining Hall of Fame in Leadville, Colorado. Representatives from the EPA and D&RGW presented the Proposed Plan. Three alternatives were discussed: No Action, Institutional Controls, and Resource Utilization. The No Action alternative was presented as EPA's and D&RGW's preferred alternative. A portion of the hearing was dedicated to accepting formal oral comments from the public. Only two questions were raised during this public meeting. These questions were in regard to the volume of the fine slag proposed for No Action and the nature of the soil beneath the Harrison St. slag pile, which is not relevant to this ROD.

4.0 SCOPE AND ROLE OF OPERABLE UNIT

The California Gulch NPL Site covers a wide area (Figure 2). EPA has established the following OUs for the cleanup of geographically-based areas within the Site. The OUs are designated as:

OU1	Yak Tunnel/Water Treatment Plant
OU2	Malta Gulch Fluvial Tailing/Leadville Corporation Mill/Malta Gulch Tailings Impoundments
OU3	D&RGW Slag Piles/Railroad Easement/Railroad Yard and Stockpiled Fine Slag
OU4	Upper California Gulch
OU5	ASARCO Smelter/Slag/Mill Sites
OU6	Starr Ditch/Penrose Dump/Stray Horse Gulch/Evans Gulch
OU7	Apache Tailing Impoundments
OU8	Lower California Gulch
OU9	Residential Populated Areas
OU10	Oregon Gulch
OU11	Arkansas River Valley Floodplain
OU12	Site Water Quality

The purpose of the D&RGW Slag Piles/Railroad Easement/Railroad Yard OU RI/FS was to gather sufficient information to support an informed risk management decision on which remedies are the most appropriate for the D&RGW Stockpiled Fine Slag portion of OU3. The RI/FS was performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300, and CERCLA Section 104, 42 U.S.C. º 9604.

The objectives of the RI/FS were to:

- Determine the nature and extent of metals in source areas and other affected areas within the D&RGW Slag Piles/Railroad Easement/Railroad Yard OU;

- Define the potential pathways along which metals can migrate, as well as the physical processes and, to the extent necessary, the chemical processes that control these pathways;

- Determine risk assessment information including potential receptors, exposure patterns, and food chain relationships; and

- Develop, screen, and evaluate remedial alternatives and predict the consequences of each remedy.

Based on the findings of previous investigations and the results of the D&RGW Slag Piles/Railroad Easement/Railroad Yard OU RI/FS, the sources and areas of environmental contamination at the Stockpiled Fine Slag (AV Smelter Slag Pile) portion of OU3 have been adequately delineated.

The remedy outlined in this ROD represents the final remedial action only for the stockpiled fine slag at the AV Smelter Slag Pile. Remedial actions undertaken at the Stockpiled Fine Slag portion of OU3 are intended to be consistent with the remedial action objectives and goals identified for the California Gulch NPL Site and other OU investigations.

5.0 SUMMARY OF SITE CHARACTERISTICS

As a result of D&RGW processing the slag for use as railroad track ballast, the AV Smelter Slag Pile is actually composed of several sub-piles (Figure 3). The subpiles of the AV Smelter Slag Pile site include sorted fines, water-quenched fines, ballast-sized material, oversized material, and unsorted air-cooled slag. The subpiles of sorted fines consist of the less than 3/8 inch diameter slag. The ballast-sized subpile is composed of material with particle sizes ranging from approximately 3/8 inch to 2-1/2 inches in diameter. Two subpiles of oversized material from ballast processing consist of slag that is greater than 2-1/2 inches in diameter, some brick, and some scrap iron. The existing fines piles and fines potentially generated from future ballast production are the focus of this ROD. Figure 3 also depicts the location of stockpiled fine slag at the AV Smelter Slag Pile. This and a small amount of fine slag in the railyard are the only locations within the California Gulch Superfund Site with stockpiled fine slag. The volume of stockpiled fine slag at the AV Smelter Slag Pile is approximately 190,000 cubic yards. The volume of stockpiled fine slag at the railyard was estimated at approximately 220 cubic yards (Terranext, 1996b). As noted previously, the small amount of fine slag at the railyard has been moved to the AV Smelter Slag Pile. The total volume of fine slag moved from the railyard to the AV Smelter Slag Pile was approximately 1200 cubic yards.

The following paragraphs discuss the primary contaminants of concern, summarize the nature and extent of contamination, and provide a brief description of contaminant fate and transport.

Site Characterization Summary - Stockpiled Fine Slag

During the Lead Slag Pile RI (MK, 1992) a total of 18 slag samples were collected from the AV Smelter Slag Pile (Figure 4). Four of these samples were collected from the sorted fines and four from the water-quenched fines subpiles. These samples were collected from the surface to a depth of 3 feet. In addition, four subslag samples were collected from four coreholes drilled at the AV Smelter Slag Pile. Two of these subslag samples were collected from directly below the water-quenched fines subpile. Each sample was submitted for laboratory compositional and leachability analysis. Material from the finer-grained slag piles was also submitted for particle size testing. Compositional analyses included total metals, water-soluble anions, and acid-base accounting. Leachability testing included Synthetic Precipitation Leaching Procedure (SPLP)(EPA Method 1312) and column leach tests, which were intended to simulate, as closely as possible, in situ conditions (Terranext, 1996a).

Compositional results showed that the slag is an iron magnesium silicate, with residual base metals. Concentration means for the four primary metals of concern collected from fine slag sample locations at the Site are as follows:

- Arsenic means; 435 milligram per kilogram (mg/kg) -sorted fines, 909 mg/kg water quenched fines
- Cadmium means; 11.9 mg/kg-sorted fines, 16.6 mg/kg water-quenched fines
- Lead means; 10,800 mg/kg-sorted fines, 9,650 mg/kg water-quenched fines
- Zinc means; 44,000 mg/kg-sorted fines, 73,000 mg/kg water-quenched fines

Compositional results for the two subslag soil samples (AVB103 and ABV104) collected beneath the water-quenched fines showed concentrations of metals of concern to be significantly lower than those for the slag material, and within the range of literature values for metals occurring naturally in soil (MK, 1992-Table 4-15). These samples showed the lowest value for arsenic (5.7 mg/kg), lead (84.8 mg/kg) and for zinc (188 mg/kg) from all subslag soil samples collected. Site-specific background has not been established, however, ranges for metals of concern in Colorado soils are as follows: arsenic (1.2-24 mg/kg), lead 15-150 mg/kg) and zinc (16-300 mg/kg)(Terranext, 1996a). The subslag soil samples collected from beneath the water-quenched fine slag at AV exhibited a negative acid-forming potential.

Leaching analysis, which included both SPLP and column leach studies, showed minimal leaching of metals of concern. Synthetic Precipitation Leaching Procedure results for all elements tested in slag were below the toxicity characteristic criteria, listed in 40 CFR 261.24. Mean values for the contaminants of concern were generally two orders of magnitude lower than these regulatory thresholds. Column leach tests showed similar low levels of leaching (Terranext, 1996a).

Particle size data and site-specific meteorological data were used to determine whether slag in the fine-grained piles has the ability to become airborne. Threshold friction velocities (the wind speed above which the surface material becomes airborne) were calculated using the mode of the aggregate size distribution. Wind data and the height of the piles were used to calculate the friction velocity. Results for the two fines piles are:

Threshold Friction Velocity	
sorted fines	1.0 meters per second (m/sec)
water-quenched fines	0.58 m/sec
Friction Velocity	0.55 m/sec

A friction velocity lower than the threshold friction velocity demonstrates that sustained wind gusts (0.55 m/sec, MK 1992) in Leadville are not fast enough to cause wind erosion of the fines slag piles.

Groundwater

A site-wide monitoring program will be developed at the California Gulch Superfund Site once all source areas have been addressed. Groundwater in the vicinity of the stockpiled fine slag has not been fully characterized. As noted above, the subslag material showed concentrations of metals of concern to be significantly lower than those for the slag material, and within the range of literature values for metals occurring naturally in soils. These results suggest that surface water infiltration through the slag piles does not significantly impact groundwater nor does it impact the soils beneath the slag piles, as evidenced by the results of the soil analyses (Terranext, 1996a).

Surface Water

No discreet conveyances of surface water runoff from the AV area have been noted. Additionally, the berm placed along the California Gulch is designed to eliminate surface water runoff from directly entering the California Gulch (Terranext, 1996a).

Soils

Analysis of subslag soils from beneath the fine slag piles show the lowest concentration for lead, arsenic and zinc of any of the subslag samples collected (Terranext, 1996a).

Discussion of Fate and Transport

Existing pathways for potential migration of metals of concern include wind, leaching, mixing by human activities, runoff, and direct contact.

Release Mechanism 1 - Wind

The air pathway analysis results indicate that wind erosion is not a viable release mechanism for the lead slag piles, including the AV water-quenched and sorted fines piles.

Release Mechanism 2 - Leaching

Testing in subslag material does not indicate that leachate from slag contributes to elevated metals concentrations in the vadose zone beneath the slag piles. This conclusion is supported by the lack of acid-generating potential and the neutral-to-basic pH of the slag and subslag materials.

Release Mechanism 3 - Mixing by Human Activities

Transport of slag by human activities has occurred, as it was historically used for road maintenance within the Site by Lake County and the Colorado Department of Transportation. This mechanism will not continue in the future as reuse of the slag material is controlled as specified in this ROD.

Release Mechanism 4 - Surface Water Runoff

No evidence of transport of slag fines by surface water runoff was observed at any of the examined piles. Slag does not appear to be transported from piles onto adjacent soils in rivulets or channels. Pile integrity, especially for fines piles where this is most critical, appears intact. This potential release mechanism for slag is not a concern at the AV Smelter Slag Pile.

Release Mechanism 5 - Direct Contact

Due to the physical characteristics of the slag piles, direct contact with the slag piles was considered unlikely in EPA's Preliminary Baseline Human Health Risk Assessment (EPA 1991). Therefore, it was eliminated as a release mechanism.

6.0 SUMMARY OF SITE RISKS

In the Preliminary Baseline Human Health Risk Assessment (EPA, 1991) lead and arsenic were identified as the primary chemicals of potential concern at the California Gulch NPL Site. Since the completion of the preliminary risk assessment, several important studies were completed that provided more extensive and more reliable data on environmental concentrations and on human and ecological exposures. Leadville officials and business leaders expressed concern over possible risks and liabilities associated with commercial and recreational uses within the Site. Therefore, in the final baseline risk assessment, risks posed by environmental contamination to current or future workers in the commercial and business district of the community and to people who engage in recreational activities in and around the community were evaluated. The assessment was conducted to determine if environmental contamination was of concern at any locations presently zoned commercial/industrial and to address concerns regarding the development of a proposed bike path around the community (EPA, 1996).

In 1995, EPA completed two parts of the Baseline Human Health Risk Assessments for the California Gulch Superfund Site. These are: Part A Risks to Residents from Lead (EPA,1995b), and Part C Evaluation of Recreational, Worker Scenarios (EPA, 1995c). Part A evaluates risks to residents from lead; and Part C evaluates risks to workers in the commercial and business district and to recreational users in areas in and around the community. The following paragraphs summarize results of the final baseline risk assessment as they relate to the stockpiled fine slag at the AV Smelter Slag Pile.

Terrestrial and aquatic risks associated with exposure to site chemicals were also evaluated by EPA. Aquatic risks were evaluated in the Final Baseline Aquatic Ecological Risk Assessment (EPA, 1995d) and terrestrial risks were evaluated in the Ecological Risk Assessment for the Terrestrial Ecosystem (EPA, 1997).

6.1 RESIDENTIAL EXPOSURE TO SLAG

The evaluation of exposure to contaminants at waste piles included consideration of slag pile data, with an exposure scenario conservatively evaluating a child playing on the waste piles who may come in contact with contaminants through inadvertent ingestion or dermal (skin) contact. The dermal contact pathway was determined to be minimal and was not considered further. The residential risk assessment also determined that non-lead metals in most waste piles pose either no risk or only low risk from direct contact while playing on the piles. For the evaluation of lead exposure at the waste piles, the data were found to be too limited to derive reliable estimates of the potential impact of direct exposures to children who play on waste piles. Therefore a quantitative evaluation was not performed. As stated in the preliminary risk assessment and the SFS, direct contact of residents with the slag piles is not expected to occur.

Wind erosion and direct contact were not considered viable release mechanisms for the stockpiled fine slag. However, based on the results of the risk assessment, there is some concern about the potential for particulate release and human exposure should resource utilization of the stockpiled fine slag be undertaken. For example, inhalation of slap particles could occur if the material is disturbed from its current state. If the resource utilization option is exercised, measures would be required to prevent contaminant releases.

6.2 RESIDENTIAL EXPOSURE TO IMPACTED GROUNDWATER

The remedial action objective in the 1993 SFS was to prevent leaching of metals of concern in concentrations that would have an adverse impact on soils, surface water, or groundwater in the area near the slag piles. The 1996 FS determined that testing of material under the slag pile did not indicate that migration of contaminants by leaching from the slag contributes to elevated metals beneath the slag piles. In addition, the final baseline risk assessment determined that groundwater from this aquifer is not currently used for drinking, and it is relatively unlikely that it will be used for drinking in the future. It has been determined that there is a minimal potential for release of metals in leachate from the stockpiled fine slag, and that the stockpiled fine slag poses an insignificant impact on water quality (EPA, 1996).

6.3 RECREATIONAL USER EXPOSURE TO SLAG

The AV Smelter Slag Pile area is situated in an area presently zoned as industrial/mining and is not considered a recreational use area, thus, there is no complete exposure pathway.

6.4 WORKER EXPOSURE TO SLAG

There are no current worker exposure pathways to the stockpiled fine slag. The Selected Remedy provides a contingency for resource utilization, which may be undertaken in the future. The EPA has determined that resource utilization of the stockpiled fine slag is only appropriate if it is encapsulated for reuse, to deter the potential release of airborne particulates and eliminate potential risk associated with resource utilization activities. Encapsulation can include the use of fine slag in concrete or asphalt aggregate; or as road base, backfill or other construction material as long as the fine slag is chemically bound or physically separated from any exposure scenario by a barrier consisting of another material. Dust suppressants to control particulate emissions and best management practices to control stormwater runoff would also be employed to contain contaminant releases during implementation of the contingency remedy.

In response to concerns raised by Leadville officials and business leaders over potential liability associated with business development within a Superfund Site, EPA developed action levels to determine if chemical concentrations were of concern at any locations presently zoned for commercial and industrial purposes. Action levels were developed only for arsenic and lead, the contaminants of most concern at the Site. The action levels were developed only for soil and dust ingestion; exposure to other media (e.g., slag piles, waste piles) and exposure to soil/dust via other pathways (e.g., dermal) are considered of insignificant concern for workers.

The soil action level for lead based on commercial/industrial exposure to soil and dust ranged from as low as 2,200 parts per million (ppm) to as high as 19,100 ppm with central tendency values in the 6,100 to 7,700 ppm range. Lead concentrations in soils in and around the slag piles (maximum lead concentration of 794 ppm) were well below the lead action level (EPA 1996).

Soil action levels for arsenic based on commercial/industrial exposure to soil and dust ranged from as low as 330 ppm to as high as 1,300 ppm, with central tendency values in the 610 to 690 ppm range. Arsenic concentrations in soils in and around the slag piles (maximum arsenic concentration of 5.7 ppm) were well below the lowest arsenic action level.

6.5 ENVIRONMENTAL EXPOSURE TO SLAG

6.5.1 AQUATIC EXPOSURE

There are no aquatic exposure pathways to stockpiled fine slag due to the lack of release mechanisms. No evidence of transport of slag fines by surface water runoff was observed at any of the examined piles. Slag does not appear to be transported from piles onto adjacent soils in rivulets or channels. Pile integrity, especiaily for fines piles where this is most critical, appears intact. Surface water runoff is not a potential release mechanism for the AV Smelter Slag Pile.

Additionally, air pathway analysis results indicate that wind erosion is not a viable release mechanism for the lead slag piles, including the AV water-quenched and sorted fines piles. Leaching to groundwater is also not a potential release mechanism. Testing in subslag material indicates that leachate from slag does not contribute to elevated metals concentrations in the vadose zone beneath the slag piles. This conclusion is supported by the lack of acid-generating potential and the neutral-to-basic pH of the slag and subslag materials.

6.5.2 TERRESTRIAL EXPOSURE

Terrestrial exposure pathways to the stockpiled fine slag are unlikely to be significant. The slag piles do not offer any viable habitat or sustenance for terrestrial receptors. Although terrestrial receptors (i.e., birds, mammals) could access the slag piles, there is no habitat or food source to attract these receptors. As stated above, wind erosion, leaching, and surface water runoff are not considered potential release mechanisms for the slag piles, which considerably reduces the potential for terrestrial receptors to contact slag in more attractive environs.

7.0 DESCRIPTION OF ALTERNATIVES

A brief description of the three alternatives evaluated in the Stockpiled Fine Slag FS for the

AV Smelter Slag Pile (Terranext, 1996a) is provided below. All alternatives presented in the FS were evaluated against the nine criteria described in the next section, and then compared with each of the other options.

Alternative 1; No Action

This alternative leaves the stockpiled fine slag in place with no remediation, engineering or institutional controls, or long-term maintenance. Generally, the No Action Alternative is provided for consideration as a baseline against which other technologies can be compared, in accordance with the NCP. No Action is protective of human health and the environment, and is considered effective because no complete human or ecological exposure pathways were identified. However, a site-wide surface and groundwater monitoring program will be developed once all source areas have been addressed. Monitoring will continue until EPA determines that such monitoring is no longer necessary to ensure that human health and the environment are protected. D&RGW would conduct any required monitoring at the stockpiled fine slag pile to ensure that it poses no threat to human health or the environment. This alternative is technically feasible and cost-effective, since it does not rely on any technology and has no cost (EPA, 1996).

Alternative 2; Institutional Controls

Institutional controls involve restricting access or activities that could result in human contact with the slag or increase the potential for leaching from stockpiled fine slag. Controls include fencing, land-use restrictions, or deed restrictions. Additionally, community awareness programs could be implemented to alert the community to any physical hazards associated with the fine slag. Controls could be implemented separately or in combination. The option considered is to fence and maintain the stockpiled fine slag located at the AV Smelter Slag Pile. Fencing would eliminate the potential direct contact pathway with the fine slag piles, would be protective of human health and the environment because no complete human or ecological exposure pathways would exist (that is, children would not have access to the piles), and potential for release of metals in leachate from the stockpiled fine slag would remain minimal. Fencing would also be technically feasible. Costs associated with fencing are $163,970 with inspection and maintenance costs of $8,443 for a 30-year period (EPA , 1996).

Alternative 3; Resource Utilization

The utilization of stockpiled fine slag as a resource could involve a number of activities and/or processes. At present, although options have been identified, it is not possible to ascertain if or when the entire volume of stockpiled fine slag could be reused. Two options for the resource utilization (materials reuse) were identified in the FS: 1) to process the slag as aggregate for asphalt or concrete, 2) to use slag materials for stand-alone material in construction, such as backfill for roadbase material or pipe bedding.

Resource utilization would be protective of human health and the environment because appropriate environmental controls for particulates emissions and stormwater runoff would be required to control contaminant releases. Consideration must also be given to any toxic leaching potential for the fine slag. Resource utilization may marginally decrease the minimal metals concentrations in the stockpiled fine slag leachate through overall volume reduction. However, the effectiveness and implementability of this alternative would be affected by the regional market demand for the material. Efforts conducted to identify markets have been unsuccessful to date, but a potential for future markets exists. Therefore, the EPA has determined that this alternative should be included as a contingency with "No Action" as the preferred alternative (EPA, 1996). However, resource utilization of the stockpiled fine slag is only appropriate if it is encapsulated prior to its use or reuse. Cost effectiveness is hindered by the distance the slag material is located from a major market and the cost associated with sorting the slag. Cost for use of the fine slag as aggregate is estimated as a $1,120,000 loss after resale, while the cost for use as fill material is estimated as a $244,625 loss after resale (EPA, 1996).

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 300.430(e)(9) of the NCP requires that the agencies evaluate and compare the remedial cleanup alternatives based on the nine criteria listed below. The first two criteria, (1) overall protection of human health and the environment and (2) compliance with applicable or relevant and appropriate requirements (ARARs) in Appendix A, are threshold criteria that must be met for the Selected Remedy. The Selected Remedy must then represent the best balance of the remaining primary balancing and modifying criteria.

8.1 EVALUATION AND COMPARISON CRITERIA

8.1.1 THRESHOLD CRITERIA

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how potential risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or Institutional Controls.

2. Compliance with ARARs addresses whether or not a remedy will comply with identified federal and state environmental and siting laws and regulations.

8.1.2 PRIMARY BALANCING CRITERIA

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of toxicity, mobility and volume through treatment refers to the degree that the remedy reduces toxicity, mobility, and volume of the contamination.

5. Short-term effectiveness addresses the period of time needed to complete the remedy and any adverse impact on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability refers to the technical and administrative feasibilities of a remedy, including the availability of materials and services needed to carry out a particular option.

7. Cost evaluates the estimated capital costs, operation and maintenance costs, and present worth costs of each alternative.

8.1.3 MODIFYING CRITERIA

8. State acceptance indicates whether the State (CDPHE), based on its review of the information, concurs with, opposes, or has no comment on the preferred alternative.

9. Community acceptance is based on whether community concerns are addressed by the Selected Remedy and whether or not the community has a preference for a remedy.

8.2 EVALUATING THE STOCKPILED FINE SLAG ALTERNATIVES

The following is a brief summary of the agencies evaluation and comparison of stockpiled fine slag alternatives. Additional details evaluating the alternatives are presented in the FS. This section evaluates the performance of the stockpiled fine slag alternatives against the nine criteria discussed above, and compares it with the other possible options. Information for this section was obtained from the Final Stockpiled Fine Slag FS (Terranext, 1996a).

8.2.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This criterion is based on the level of protection of human health and the environment afforded by each alternative. All of the alternatives are protective of human health. No complete human or ecological exposure pathways have been identified. Based upon the chemical composition of the slag and soil sampling conducted beneath the slag, the potential for release of metals in leachate from the stockpiled fine slag is minimal. The stockpiled fine slag has, at most, insignificant non-point source impact on water quality.

The physical features of the slag piles have remained relatively unchanged for many decades. That fact, combined with the determination that the only potential release pathway is through leachate, suggests that the status of the slag is not likely to change in the near or long term.

Therefore all three alternatives are protective of human health and the environment.

8.2.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

This criterion is based on compliance with chemical-, location-, and action-specific ARARs. ARARs are presented in Appendix A. All of the alternatives meet ARARs. Groundwater quality is a function of the active interchange with surface water degraded by the release of more mobile metal species from the multitude of other contaminant sources in the vicinity. The potential for non-point source metals loading to surface water from stockpiled fine slag leachate is minimal to nonexistent. The use of institutional controls on the stockpiled fine slag will not have any effect on groundwater quality. Non-point source, Best Management Practices (BMP)to-be-considered criteria have been implemented along the slag piles contacting California Gulch.

8.2.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

This criterion is based on the magnitude of residual risk and adequacy and reliability of controls. No Action is an effective long-term alternative. The only identified release pathway determined to have any potential to contribute to human or environmental risks is the potential for metals to leach from the stockpiled fine slag. Based upon subslag sampling, metals have not leached and will not leach from the stockpiled fine slag in concentrations that will have an adverse impact on soils, surface water or groundwater in the vicinity. Based upon the hardness of the slag, the lack of acid-generating potential and the absence of significant metals in soils beneath the slag, the potential for exposure to metals of concern found in the slag is unlikely to change in the long term. Institutional controls can be effective in the long term, but are not permanent. Fencing requires inspections, maintenance and community awareness, and must be renewed or replaced periodically. Resource utilization represents a reliable alternative which uses known technologies, limited only by the regional market demand for the stockpiled fine slag. Resource utilization will not have a dramatic effect on the residual risk, as the pre-resource utilization risks are minimal.

8.2.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

This criterion is based on the treatment process used; the amount of contamination destroyed or treated; the reduction of toxicity, mobility, and volume; the irreversible nature of the treatment; the type and quantity of residuals remaining; and the statutory preference for treatment.

Institution controls and No Action do not further reduce the very limited toxicity or mobility of metals of concern in the stockpiled fine slag. In the absence of complete exposure pathways, there is no indication that toxicity and mobility of hazardous substances in the slag pose a human health risk. From a land-use perspective, the slag volume is not an issue as tourists come specifically to observe historic mining practices. Implementation of institutional controls or the No Action alternative, however, will not reduce the volume of the fine slag found at the site.

Over time, reuse could reduce the very limited potential toxicity and potential mobility of the stockpiled fine slag. From a land-use perspective, the change in the total volume of all types of slag will not be significant if only the stockpiled fine slag is utilized.

8.2.5 SHORT-TERM EFFECTIVENESS

This criterion is based on the degree of community and worker protection offered, the potential environmental impacts of the remediation, and the time until the remedial action is completed. No action and institutional controls do not create additional risk to the Leadville community during implementation. For institutional controls, workers and the community can be adequately and reliability protected if fencing were to be installed.

Resource utilization can also be implemented with no additional risk to the Leadville community. Workers and the community can be adequately and reliably protected from fugitive particulates and changes in storm-water drainage when the stockpiled fine slag is utilized.

8.2.6 IMPLEMENTABILITY

This criterion is based on the ability to perform construction and implement administrative actions. No Action is technically feasible as it does not rely on any technology. As the status quo, no action is implementable.

Institutional controls are technically feasible, as reliable fencing can be procured and installed readily by local contractors. Land-use restrictions would require action by either the Lake County Commissioners or the Leadville Town Council. Therefore, because further action is needed by a third party, the potential of implementability of land-use restrictions cannot be predicted.

Resource utilization is also technically feasible but there are unknowns as to the marketability of the resource. Demand for the stockpiled fine slag will be dependant on a number of factors, including but not limited to, the level of construction activity in the vicinity of Leadville.

8.2.7 COST

Alternative 1; No Action

As there are no costs associated with No Action, it is the most cost effective alternative.

Alternative 2; Institutional Control

Institutional controls involve fencing and maintenance of the stockpiled fine slag located at the AV Smelter Slag Pile. Fencing the AV pile would have present value capital and labor costs of $161,000 and inspection and maintenance costs of $8,500 to inspect and maintain over a 30-year period indicated in the summary in Table 1.

Alternative 3; Resource Utilization

Resource utilization does not presently appear to be a cost-effective option even if market demands for the material are identified. Efforts conducted to identify markets have been unsuccessful to date. The options considered are 1) to process slag for use as a concrete or asphalt aggregate in construction, and 2) to utilize slag materials for a stand-alone material in construction, such as a backfill or pipe bedding.

The cost effectiveness of these options is hindered by the distance the slag material is located from a major market and the cost associated with sorting the slag. Cost estimates and a cost summary are included in Table 1. Estimates have been provided for use of the fine slag for aggregate ($1,120,000 loss after resale) and for use in fill material ($244,625 loss after resale).

8.2.8 STATE ACCEPTANCE

The State has been consulted throughout this process and concurs with the Selected Remedy.

8.2.9 COMMUNITY ACCEPTANCE

Public comment on the RI/FS and Proposed Plan was solicited during a formal public comment period extending from September 27 to October 28, 1996. It is assumed that the community is generally supportive of EPA's No Action alternative since no comments were generated during the formal public comment period. In addition, only two oral comments were raised during the public meeting held October 3, 1996. These comments were in regard to the volume of the fine slag pile and the nature of the soil beneath the Harrison St. slag pile, which is not relevant to this ROD.

8.2.10 SUMMARY

The FS used a comparative analysis to qualitatively evaluate the performance of each alternative in relation to each specific evaluation criterion. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that key tradeoffs could be identified.

A grid comparison method was used to rank the alternatives and their attainment relative to the

NCP criteria set forth in the SFS. Alternatives were ranked on a scale of 1 to 5, with 5 being the highest attainment of the criterion. Total scores for each alternative were: Alternative 1: No Action at 41; Alternative 2: Institutional Controls at 39; and Alternative 3: Resource Utilization at 36. Table 2 provides a grid comparison method to rank the alternatives and their attainment relative to the following criteria.

- Protection of Human Health and the Environment - All three alternatives are protective of human health and the environment.
- Attainment of ARARs - All three alternatives attain ARARs.
- Long-Term Effectiveness - All three alternatives have similar long-term effectiveness. Reuse of the stockpiled fine slag would marginally reduce the residual risk because of volume reduction. None of the alternatives are subject to technology failure from age or wear and tear.
- Reduction of Toxicity, Mobility or Volume - None of the three alternatives reduce the toxicity and mobility of metals of concern found in the fine slag.
- Short-Term Effectiveness - All three alternatives can be implemented in a manner which protects the Leadville community and the workers implementing the remedy. The No Action alternative eliminates disturbances of the fine grain slag and requires no workers.
- Implementability - All three alternatives are implementable. Deed restrictions are in effect. Land use restrictions may not be implementable from and administrative perspective as they require approval by the Lake County Commissioners. Reuse requires that there be a commercial market or internal need for the stockpiled fine slag which, at this time, is uncertain.
- Cost - No Action is the most cost-effective approach to meeting the remedial action objectives and attaining ARARs. There are essentially no costs associated with this remedial option.
- State Acceptance - CDPHE has been consulted throughout the RI/FS process.
- Community Acceptance - The community has been consulted throughout the RI/FS process.

Selection of the No Action alternative was based on this analysis.

9.0 SELECTED REMEDY

Based upon consideration of CERCLA requirements, the detailed analysis of alternatives, and public comments, EPA has determined that the No Action alternative presented in the Proposed Plan, with no modifications, is the appropriate remedy for the stockpiled fine slag at the AV Smelter Slag Pile of OU3 within the California Gulch Superfund Site. The No Action alternative leaves the stockpiled fine slag in its existing condition with no control or cleanup planned. The No Action alternative, as described in the Proposed Plan, includes a contingency for future utilization of the slag, if it is encapsulated prior to its use or reuse.

The No Action alternative is protective of human health and the environment, and is considered effective because no complete human or ecological exposure pathways were identified and because the potential for release of metals in leachate is minimal. Based on subslag sampling metals have not leached and will not leach from the stockpiled fine slag in concentrations that will have an adverse impact on soils, surface water, or groundwater in the area. Slag hardness, the lack of acid-generating potential, and the absence of any significant metals beneath the slag also indicate that the potential for exposure to metals of concern found in the slag is unlikely to change in the long term. This alternative is technically feasible and cost effective, since it does not rely on any technology and has no cost.

Resource utilization would only implemented if future regional market demand exists for the material. Encapsulation of the fine slag ensures that the contingency remedy is also protective of human health and the environment. Encapsulation can include the use of the fine slag in concrete or asphalt aggregate; or as road base, backfill or other construction material as long as the fine slag is chemically bound or physically separated from any exposure scenario by a barrier consisting of another material. Dust suppressants to control particulate emissions and best management practices to control stormwater runoff would also be employed to contain contaminant releases during implementation of the contingency remedy.

10.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121, EPA must select a remedy that is protective of human health and the environment; that complies with ARARs; is cost effective; and utilizes permanent solutions, and alternative treatment technologies, or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that include treatment which permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. However, the Selected Remedy, No Action, does not satisfy the statutory preference for treatment as a principal element of the remedy. Treatment was considered unnecessary as the Selected Remedy is protective of human health and the environment. The following sections discuss how the Selected Remedy meets statutory requirements.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy is protective of human health and the environment because 1) no complete human or ecological exposure pathways were identified and 2) metals have not leached and will not leach from the stockpiled fine slag that will have an adverse impact on soils, surface water or groundwater in the area.

Because the estimated action levels for recreational land-use scenarios are significantly above current surficial soil concentrations for both lead and arsenic, there appears to be relatively little uncertainty in the conclusion that current surface soils do not pose unacceptable risk levels to recreational site visitors anywhere within the OU boundaries (EPA, 1995b). In addition, the AV Smelter Slag Pile area is situated in an area presently zoned as industrial/mining and is not considered a recreational use area (EPA, 1996).

There are no current worker exposure pathways to the stockpiled fine slag. The Selected Remedy provides a contingency for resource utilization, which may be undertaken in the future. The EPA has determined that resource utilization of the stockpiled fine slag is only appropriate if it is encapsulated prior to its use or reuse, to deter the potential release of airborne particulates and eliminate potential risk associated with resource utilization activities. Dust suppressants to control particulate emissions and best management practices to control stormwater runoff would also be employed to contain contaminant releases during implementation of the contingency remedy.

The soil action level for lead based on commercial/industrial exposure to soil and dust ranged from as low as 2,200 parts per million (ppm) to as high as 19,100 ppm with central tendency values in the 6,100 to 7,700 ppm range. Lead concentrations in soils in and around the slag piles (maximum lead concentration of 794 ppm) were well below the lead action level (EPA 1996).

Soil action levels for arsenic based on commercial/industrial exposure to soil and dust ranged from as low as 330 ppm to as high as 1,300 ppm, with central tendency values in the 610 to 690 ppm range. Arsenic concentrations in soils in and around the slag piles (maximum arsenic concentration of 5.7 mg/kg) were well below the lowest arsenic action level.

10.2 COMPLIANCE WITH ARARs

The Selected Remedy will comply with all ARARs identified in Appendix A to this ROD. No waiver of ARARs is expected to be necessary.

10.3 COST EFFECTIVENESS

Section 360.430(f)(ii)(D) of the NCP requires evaluation of cost effectiveness. The Selected Remedy is cost effective because it has no cost.

10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT POSSIBLE

No remedial action is necessary to ensure protection of human health and the environment. The contingency allows for resource recovery if supported by regional market demand.

10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Treatment of the stockpiled fine slag at the AV Smelter Slag Pile was not considered because the No Action alternative is protective of human health and the environment.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for stockpiled fine slag at the AV Smelter Slag Pile was released for public comment in September 1996. The Proposed Plan identified Alternative 1, No Action, as the preferred alternative, with the contingency that resource utilization may be undertaken in the future. Resource utilization of the stockpiled fine slag would only be appropriate if it is encapsulated prior to its use or reuse. No comments were received during the public comment period. Subsequently, EPA determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

12.0 REFERENCES

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FIGURES

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<IMG SRC 98076D>
<IMG SRC 98076E>

TABLES

TABLE 1

ESTIMATES OF COSTS FOR REMEDIAL ALTERNATIVES

OPTION 1

CALIFORNIA GULCH
ARKANSAS VALLEY SLAG PILE
LEADVILLE

ALTERNATIVE: INSTITUTIONAL CONTROLS (1)

ITEM: FENCE THE AV FINE SLAG PILE

DIRECT CAPITAL COSTS;

(includes Labor, Equipment and Materials, Unless Otherwise Noted)

	Costs COMPONENT	UNIT	QUANTITY	UNIT COSTS	T0TAL CAPITAL COSTS
1.	Mobilize Materials	Lump	1	$2,700.00	$2,700
2.	Office/Storage trailer (8'x30')	Lump	1	$1,800.00	$1,800
3.	Earthwork (450 hp bulldozer)	Cubic Yards	5,000	$2.50	$12,500
4.	Utilities				
	Electric	Month	1	$1,300.00	$1.300
	Phone	Month	1	$6,00.00	$600
	Sanitary Station	Month	1	$90.00	$90
5.	Fence Materials				
	Fencing	Lineal Feet	5,300	$16.00	$84,800
	Corner Post	Each	50	$95.00	$4,750
	Braces	Each	106	$35.00	$3,710
	Double Swing Gates	Opening	3	$970.00	$2,910
	Locks	Each	3	$15.00	$45
TOTAL DIRECT COSTS					$115,205

INDIRECT CAPITAL COSTS (% of Direct Capital Costs)

1.	Engineering and Design (10% of Capital Costs)				$11,521
2.	Contingency Allowance (20% of Capital Cost)				$23,041
3.	Other Indirects				
	Regulatory License/Permits (3% of Direct Capital Costs)				$5,760
TOTAL INDIRECT COSTS					$46,082
PRESENT VALUE OF OPERATION AND MAINTENANCE COSTS Annual Inspection and maintenance		Year	30	$750.00	$8,443
TOTAL COSTS					$163,970

ASSUMPTIONS/COMMENTS

1. Eight (8) loads of fencing materials will be hauled using flatbed trailers.
2. Includes mob and demob. set-up and leveling, tear-down and monthly leasing charge.
3. Earthwork consists of consolidating sorted and water-quenched fine slags before fencing: no mob or demob. onsite contractor utilized.
4. Fencing is 6 ga. Galvanized wire, 6' high, no barbed wire.
5. Gates are 20' wide and include posts and hardware.

Source: Terranext, 1996a

TABLE 1 (Continued)

ESTIMATES OF COSTS FOR REMEDIAL ALTERNATIVES

CALIFORNIA GULCH
LEADVILLE, COLORADO

ALTERNATIVE: RESOURCE UTILIZATION (1)

ITEM: FINE SLAG ADDITIVE MATERIAL IN CONSTRUCTION
Aggregate for concrete or asphalt, additive to building materials, additive to grout, concrete and slurry formations)

DIRECT CAPITAL COSTS:
(Includes Labor, Equipment and Materials, Unless Otherwise Noted)

COMPONENT	UNIT	QUANTITY	COSTS	TOTAL COSTS
1. Rescreen Material	Cubic Yards	190,000	$5.68	$1,079,200
2. Load and haul	Cubic Yards	190,000	$3.25	$617,500
TOTAL DIRECT COSTS				$1,696,700
INDIRECT CAPITAL COSTS (% of Direct Capital Costs)				
1. Engineering and Design (10% of Capital Costs)				$169,670
2 Contingency Allowance (20% of Capital Cost)				$339,340
3. Other Indirects				
Regulatory License/Permits (5% of Direct Capital Costs)				$84,835
TOTAL INDIRECT COSTS				$593,845
CREDITS FROM SALE OF PRODUCT MATERIAL				
1. Additive	Cubic Yard	171,000	$6.50	$(1,111,500)
2. Backfill Material	Cubic Yard	19,000	$3.10	$(58,900)
TOTAL CREDIT				$(1,170,400)
TOTAL COSTS/PROFIT(S)				$1,120,145

ASSUMPTIONS/COMMENTS

1. AV fine slag pile volumes are used to compute costs.
2. 90% of material will be suitable for use as additive.
3. 10% of material used as backfill material.
4. No operations and maintenance costs are necessary over an extended period.
5. Credits from sale of product material have been reduced to reflect transportation costs to a major market.

TABLE 1 (Continued)

ESTIMATES OF COSTS FOR REMEDIAL ALTERNATIVES

CALIFORNIA GULCH
LEADVILLE, COLORADO

ALTERNATIVE: RESOURCE UTILIZATION (2)
ITEM: USED AS STAND ALONE MATERIAL IN CONSTRUCTION (Fill material)

DIRECT CAPITAL COSTS:
(Includes Labor, Equipment and Material, Unless Otherwise Noted)

COMPONENT	UNIT	QUANTITY	CAPITAL COSTS	TOTAL COSTS
1. Load and Haul	Cubic Yards	190,000	$3.25	$617,500
TOTAL DIRECT COSTS				$617,500
INDIRECT CAPITAL COSTS (% of Direct Capital Costs)				
1. Engineering and Design (10% of Capital Costs)				$61,750
2. Contingency Allowance (2% of Captial Cost)				$123,500
3. Other Indirects				
Regulatory License/Permits (5% of Direct Capitol Costs)				$30,875
TOTAL INDIRECT COSTS				$216,125
TOTAL COSTS (Direct plus Indirect)				$833,625
CREDITS FROM SALE OF PRODUCT MATERIAL				
1. Backfill Material	Cubic Yard	190,000	$3.10	$(589,000)
TOTAL CREDIT				$(589,000)
TOTAL COSTS/PROFIT(S)				$244,625

ASSUMPTIONS/COMMENTS

1. AV Fine slag volumes are used to compute costs.
2. 100% of materials will be suitable for use as backfill.
3. Load and haul is for conveyance to suitable rail loading dock.
4. Credits from sale of product material have been reduced due to transportation costs to a major market.
5. Annual Operation and Maintenance costs are included in estimate.

Source: Terranext, 1996a

TABLE 2
GRID COMPARISON METHOD FOR ALTERNATIVES ANALYSIS

Criterion	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3 Resource Utilization
1) Protection of Human Health and Environment	5	5	5
2) Attainment of ARARs	5	5	5
3) Long term Effectiveness	4	4	5
4) Reduction of Toxicity, Mobility or Volume	2	2	2
5) Short term Effectiveness	5	4	3
6) Implementability	5	5	3
7) Cost	5	4	3
8) State Acceptance	5	5	5
9) Community Acceptance	5	5	5
Total	41	39	36

Notes: Scale of 1-5, where 5 = Highest Attainment
Source: Terranext, 1996a

APPENDIX A

ARARs

SUMMARY OF FEDERAL AND STATE ARARS

Standard, Requirement, Criteria, or Limitation	Citation	Applicable	Relevant and Appropriate	Description
		FEDERAL		
Clean Air Act, National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	No	No	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review program address only major sources. There will be no emissions associated with the chosen remedial action in OU3. Emissions associated with the contingency remedy will be limited to fugitive dust associated with moving and sorting the slag for reuse. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not ARARs. See Colorado Air Pollution Prevention and Control Act concerning applicability of requirements implemented through the SIP.
National Historic Preservation Act (NHPA)	16 USC º 470 et seq. 40 CFR º 6.301(b) 36 CFR Part 63, Part 65, Part 800	Yes	---	Expands historic preservation programs; requires preservation of resources included in or eligible for listing on the National Register for Historic Places.
Executive Order 11593 Protection and Enhancement of the Cultural Environment	16 USC º 470	Yes	---	Directs federal agencies to institute procedures to ensure programs contribute to the preservation and enhancement of non-federally owned historic resources. Consultation with the Advisory Council on Historic Preservation is required if removal activities should threaten cultural resources.
Hazardous materials Transportation Act	49 USC º 1801-1813 49 CFR 107, 171-177	Yes (for contingency reuse only)	---	Regulates transportation of hazardous materials.

SUMMARY OF FEDERAL AND STATE ARARS (Continued)

Standard, Requirement, Criteria, or Limitation	Citation	Applicable	Relevant and Appropriate	Description
STATE OF COLORADO				
Colorado Air Pollution Prevention and Control Act	5 CCR 1001, Regulation 1, Section III.D	Yes	---	Requires all sources of particulate emissions to apply technically feasible and economically reasonable control measures. APCD has the authority to ask for a fugitive emission control plan from any location, if blowing particulate matter is a problem. The site does not need to be in active use for this requirement to apply. Technically feasible and economically reasonable control measures will be applied to reuse of the stockpiled fine slag.
Colorado Air Pollution Prevention and Control Act	5 CCR 1001-3; Sections III.D.1.b,c,d. Sections III.D.2.b,c,e,f,g. Regulation I	Yes (for contingency reuse only)	---	Regulation No. 1 provisions concerning fugitive emissions for storage and stockpiling activities, haul roads, and haul trucks are applicable (5 CCR 1001-3; Sections III.D,2.b,c,e,f,g.) to the reuse contingency.
Colorado Air Pollution Prevention and Control Act	5 CCR 1001-4; Regulation 2	Yes (for contingency reuse only)	---	Provisions concerning odors would be applicable if contingency reuse were to cause objectionable odors.
Colorado Air Pollution Prevention and Control Act	5 CCR 1001-5 Regulation 3 APENs	Yes (for contingency reuse only)	---	Substantive provisions of APENs will be met.
Colorado Air Pollution Prevention and Control Act	5 CCR 1001-10 Part C (I)&(II) Regulation 8	Yes (for contingency reuse only)	---	Regulation 8 sets emission limits for lead. Applicants are required to evaluate whether the proposed activities would result in the Regulation 8 lead standard being exceeded. There are no emissions associated with the chosen remedial action. The contingency reuse in OU3 is not projected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with Regulation 8 will be achieved by adhering to a fugitive emissions control plan prepared in accordance with Regulation No. 1.

SUMMARY OF FEDERAL AND STATE ARARS (Continued)

Standard, Requirement, Criteria, or Limitation	Citation	Applicable	Relevant and Appropriate	Description
Colorado Air Pollution Prevention and Control	5 CCR 1001-14; Ambient Air Quality Standards	Yes (for contingency reuse only)	---	Provisions concerning State TSP standards and Federal PM-10 standards would apply if contingency reuse occurs, or if the Site is the subject of fugitive emission complaints. In such a case, compliance with the applicable provisions of the Colorado air quality requirements will be achieved by adhering to a fugitive emissions control plan prepared in accordance with Regulation No. 1.
Colorado Water Quality Control Act, Storm Water Discharge Regulations	5 CCR 1002-2	Yes	---	Establishes requirements for storm water discharges (except portions relating to Site-wide Surface and Groundwater). Substantive requirements for storm water discharges associated with construction activities are applicable.
Colorado Noise Abatement Act	CRS °° 25-12-101 to 108	Yes (for contingency reuse only)	---	Establishes maximum permissible noise levels for particular time periods and land use.